



Fire Weather Monitoring and Coastal Fire Risk Assessment in North Carolina

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Fire Weather Monitoring

- Discussions with NC Forest Service for 10+ years
- Developed **Fire Weather Intelligence Portal** beginning in 2011
- Brought existing resources and new information into one site



Fire Weather Intelligence Portal

[Help](#) [Station Status](#) [Show URL for current view](#)



Past Conditions

Current Conditions

Forecast Conditions

Location

Use my current zoom level & location

Zoom to a state Zoom to a county

North Carolina ▼

Observation Time

Most recent ob (11 am)

Point Data

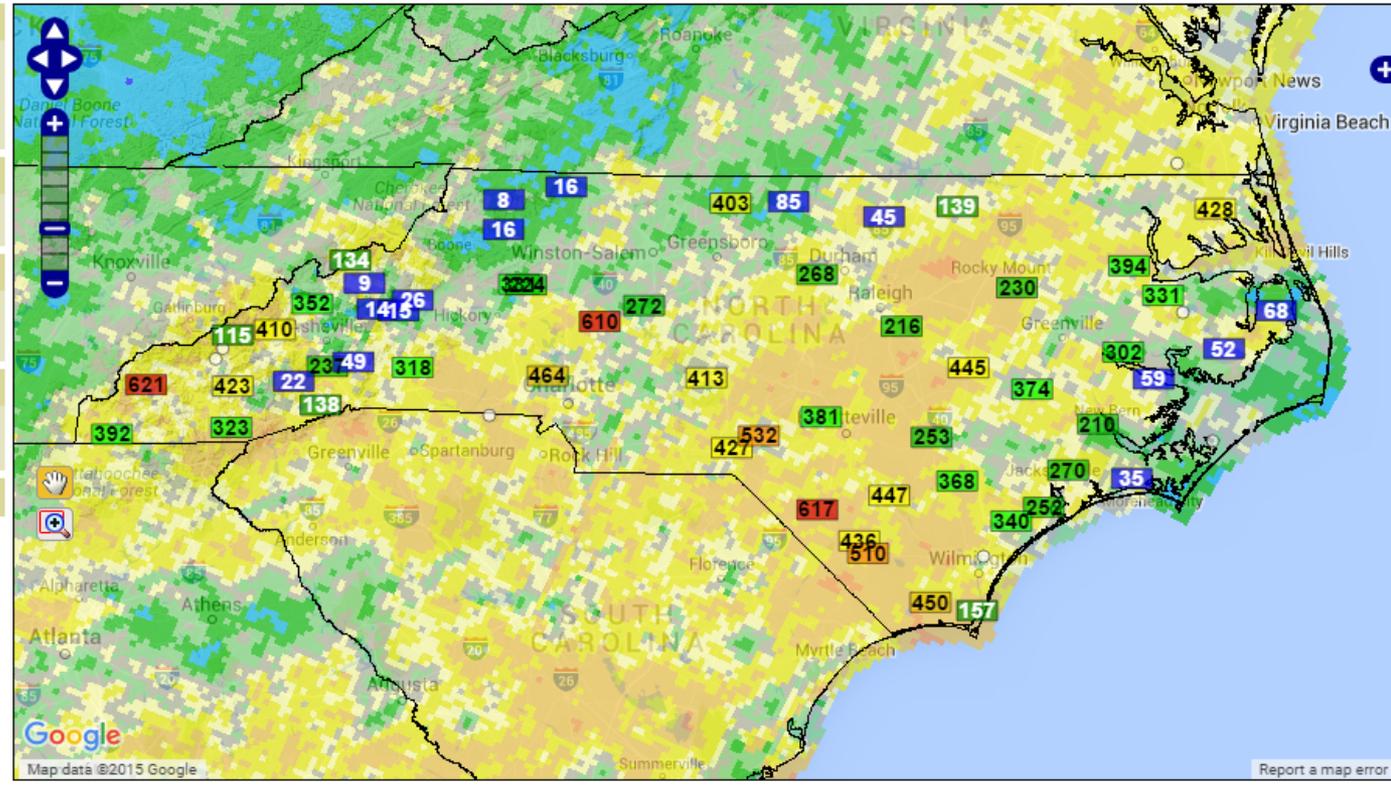
One parameter Four parameters

KBDI ▼

Gridded Data

Percent of Normal Precip. ▼

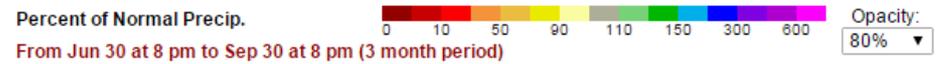
View for the previous 3 ▼ months



Toggle Station Networks: RAWs ECONet ASOS AWOS Hide overlapping stations



From yesterday (Sep 30) at 1 pm

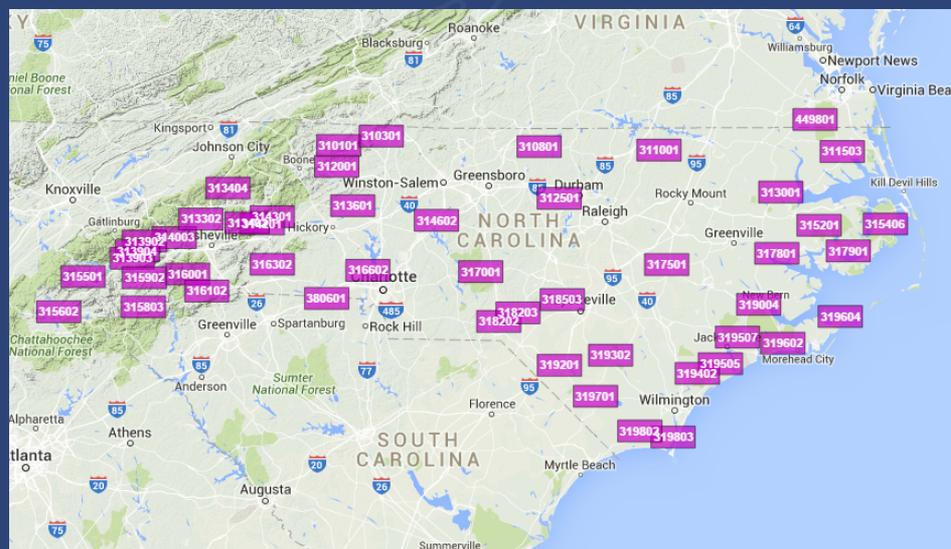


From Jun 30 at 8 pm to Sep 30 at 8 pm (3 month period)



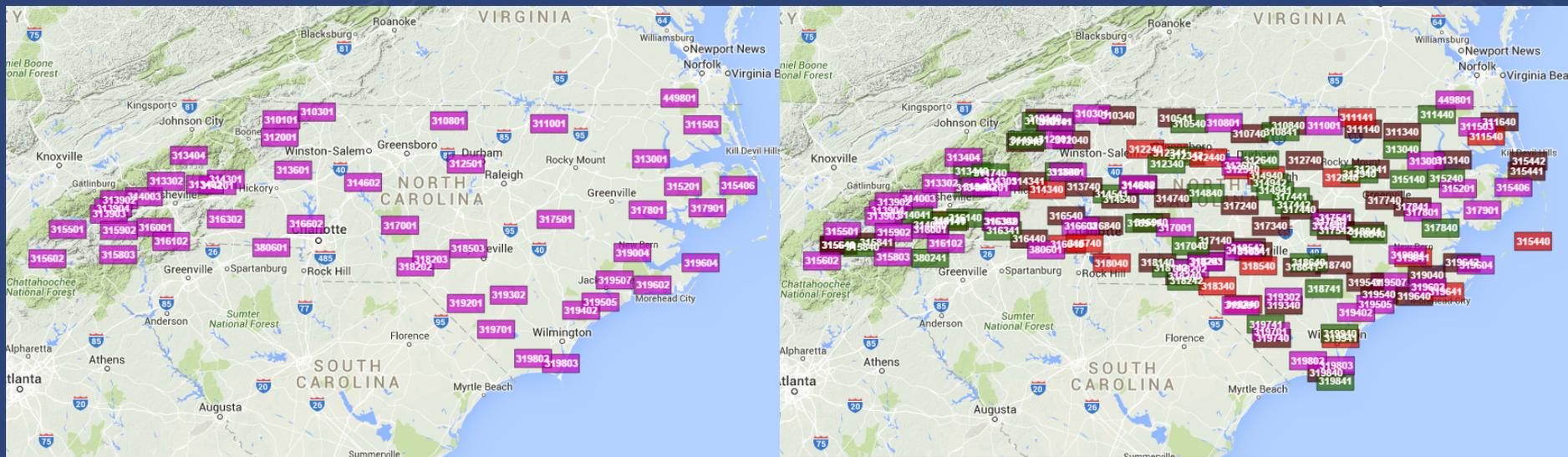
Fire Weather Portal

- Increased data availability



Fire Weather Portal

- Increased data availability



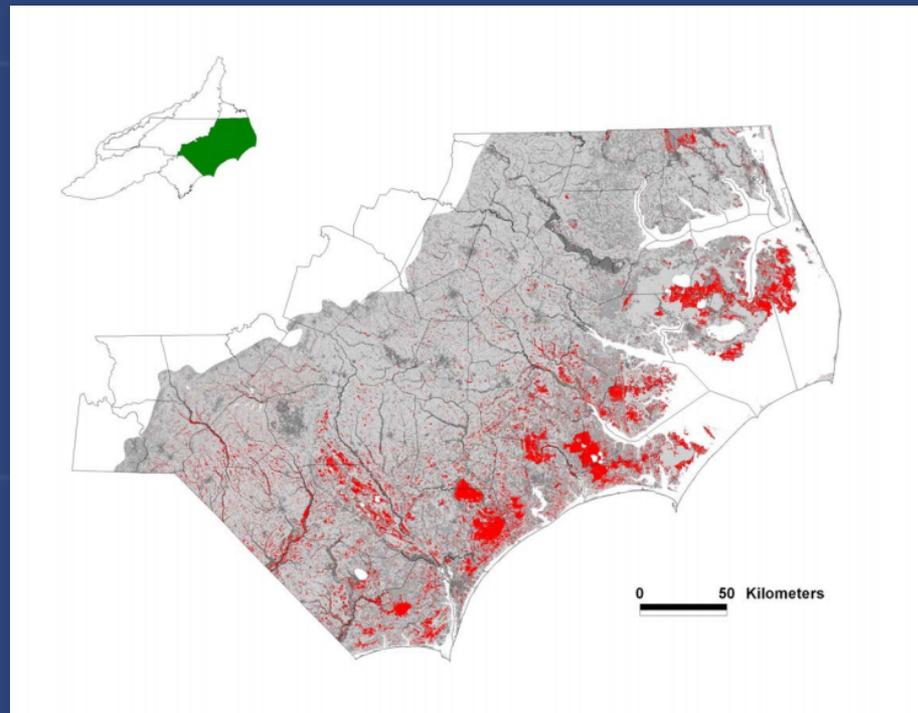
Fire Risk Indicators

- Risk estimates calculated from weather station data
 - Keetch-Byram Drought Index
 - National Fire Danger Rating System
 - Energy Release Component
 - Spread Component
 - Burning Index
- Unanswered questions
 - NIDIS & CISA-funded study of organic fire risk



Organic Soils: Background

- Organic soils common in eastern NC
- Support fires in subsurface root zone
- History of large wildfires



Map from NCGAP, 1992



Organic Soil Monitoring

- Experimental monitoring stations in eastern NC
- Collected fuel moisture, soil moisture data
- Soil moisture content is basis for Estimated Smoldering Potential

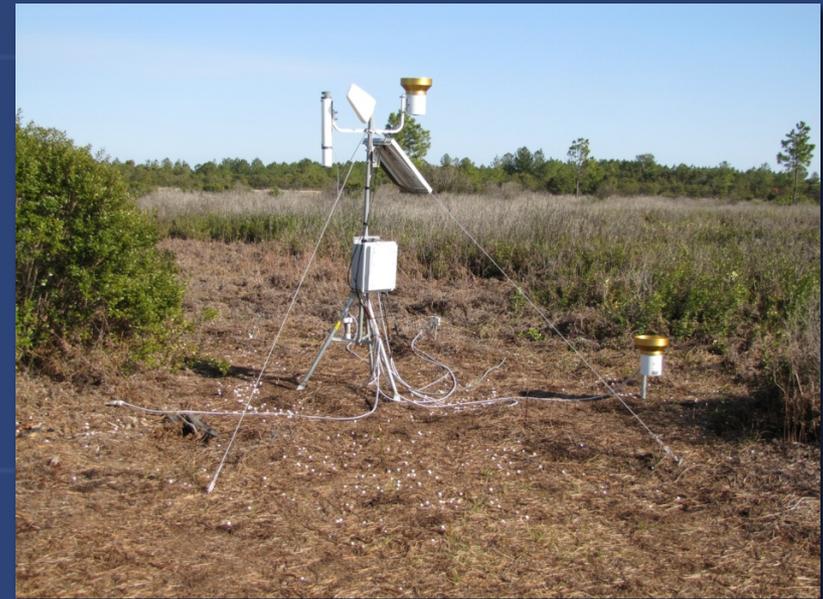
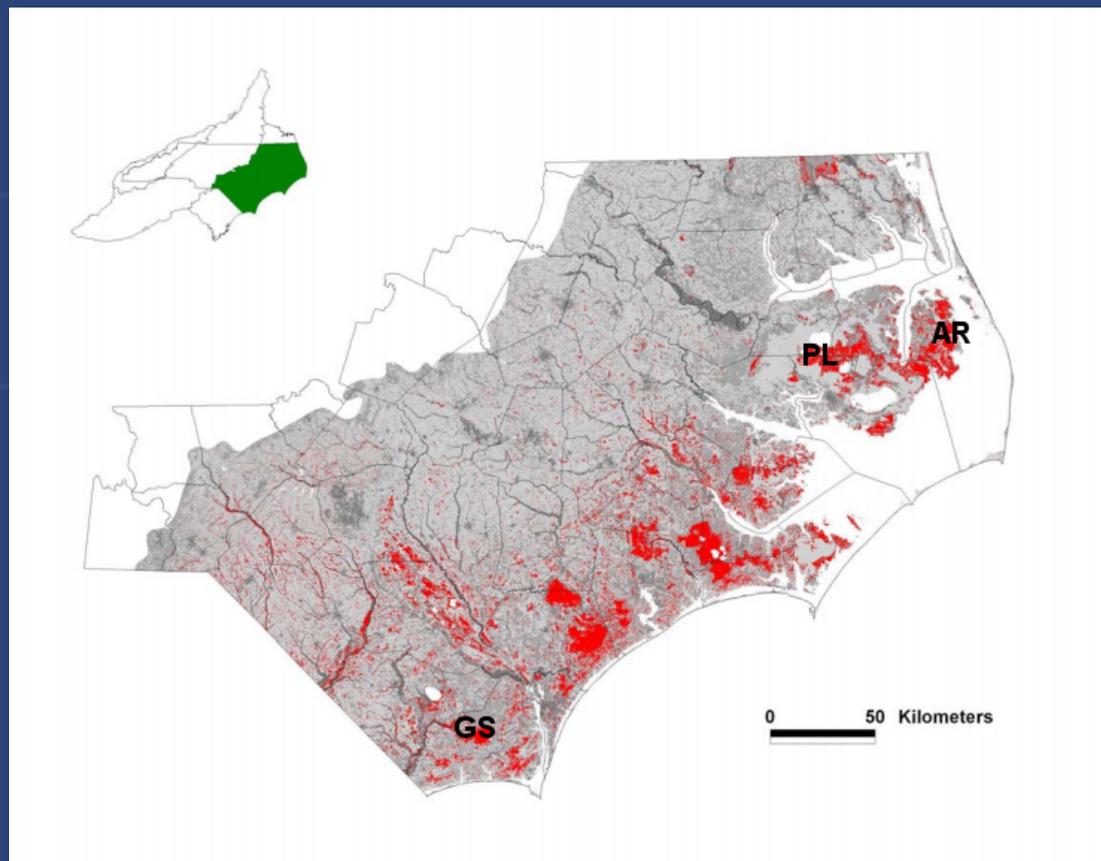


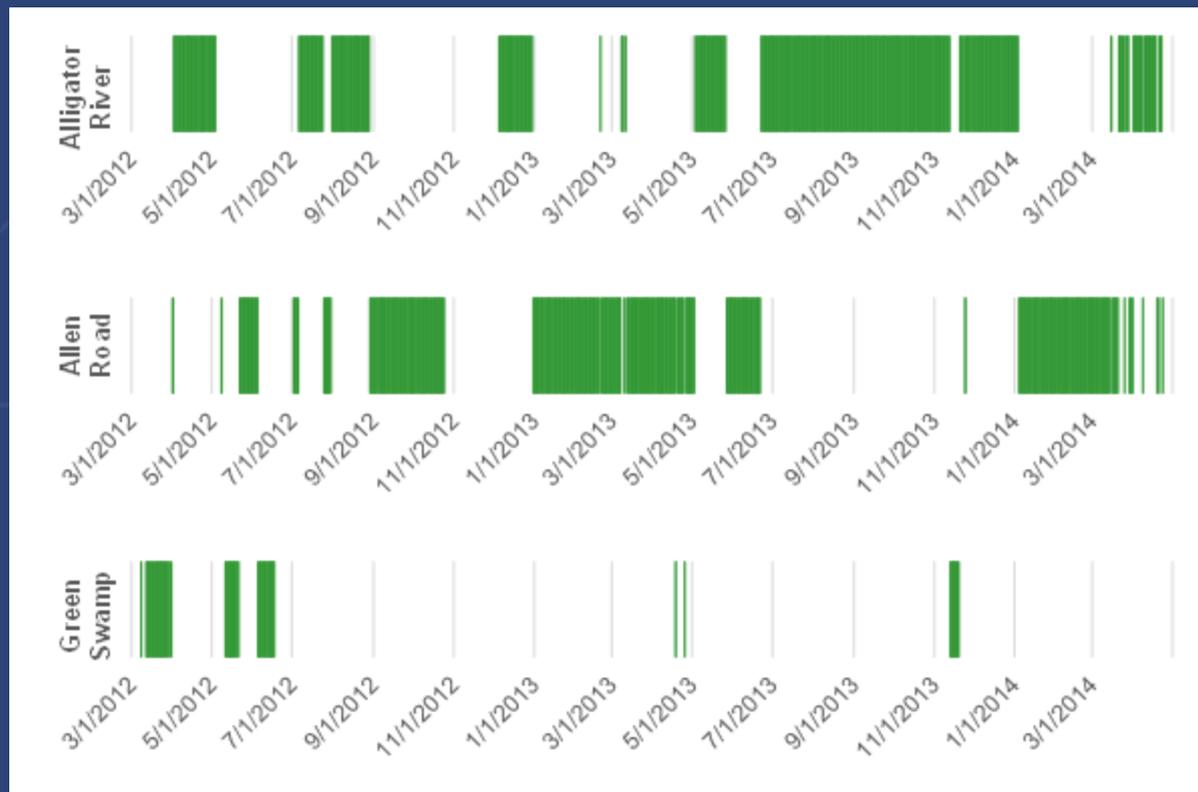
Image by Jim Reardon, 2011



ESP Monitoring Sites



ESP Data Availability



Methodology

- Compare ESP soil moisture data with potential measures of organic fire risk:
 - AHPS daily precipitation
 - Standardized Precipitation Index
 - Gridded Keetch-Byram Drought Index
 - RAWs Energy Release Component



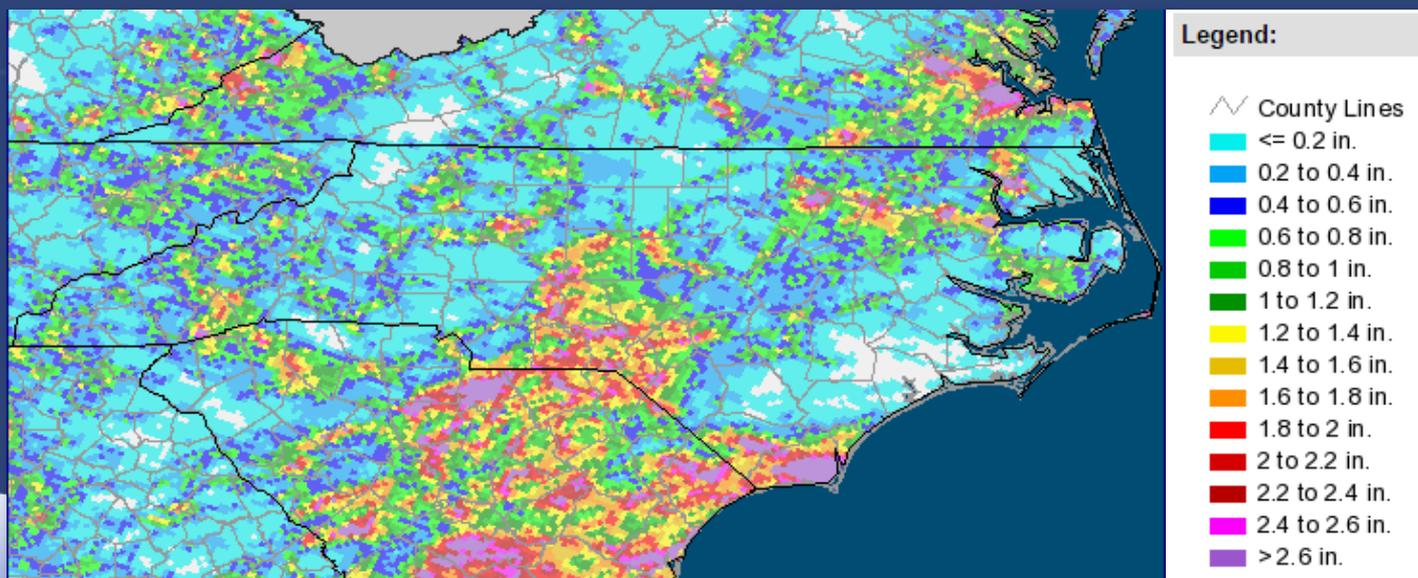
Keetch-Byram Drought Index

- Estimate of moisture deficit in the soil
- 0 to 800 = 0 to 8 inches of dryness
- Based on annual average precipitation, daily maximum temperature & precipitation

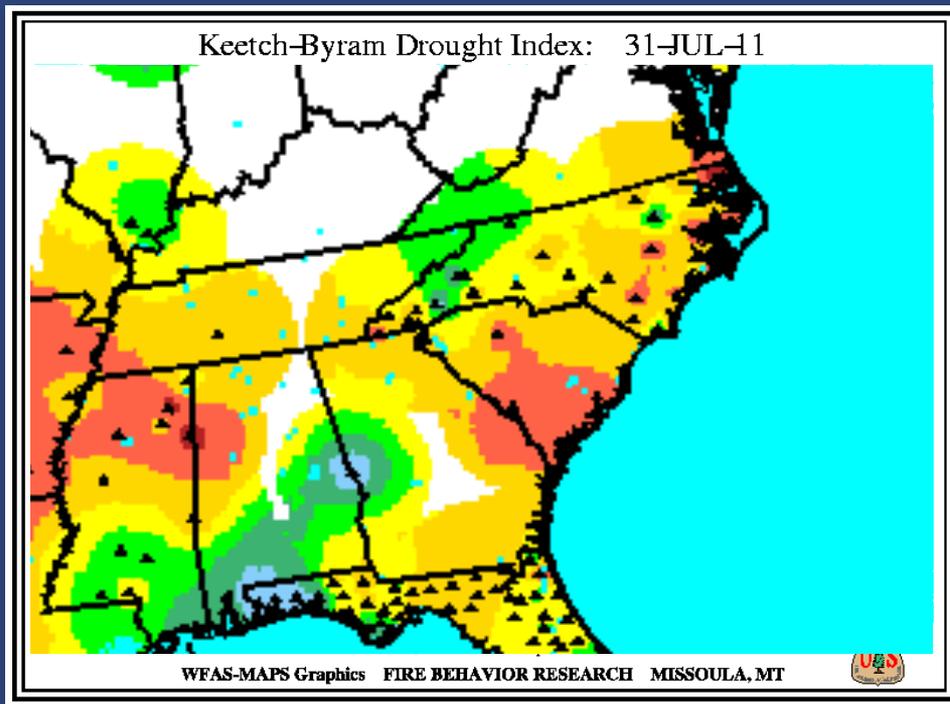


Gridded KBDI

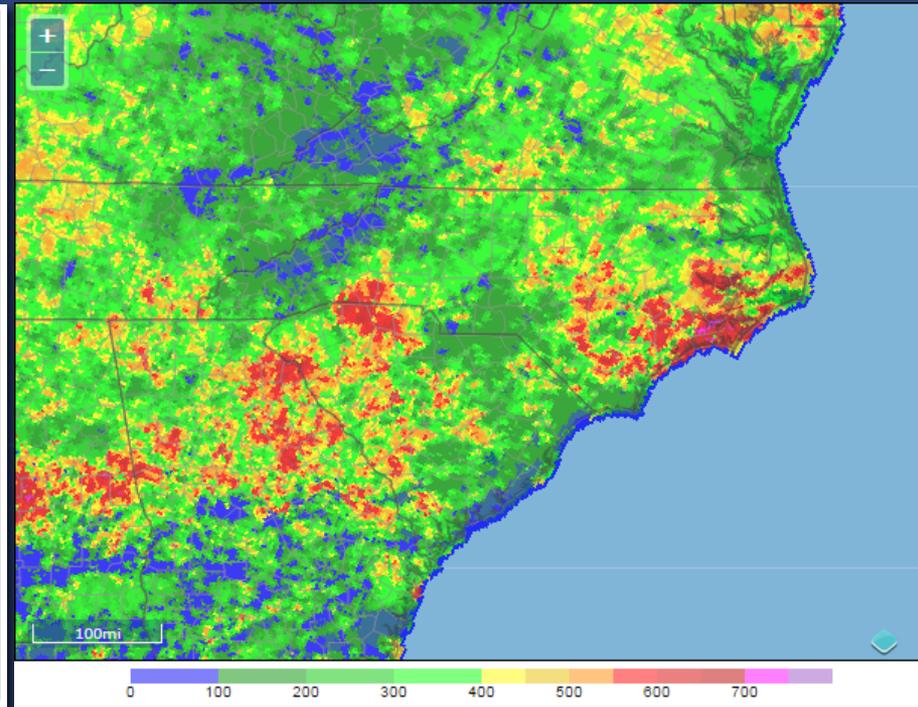
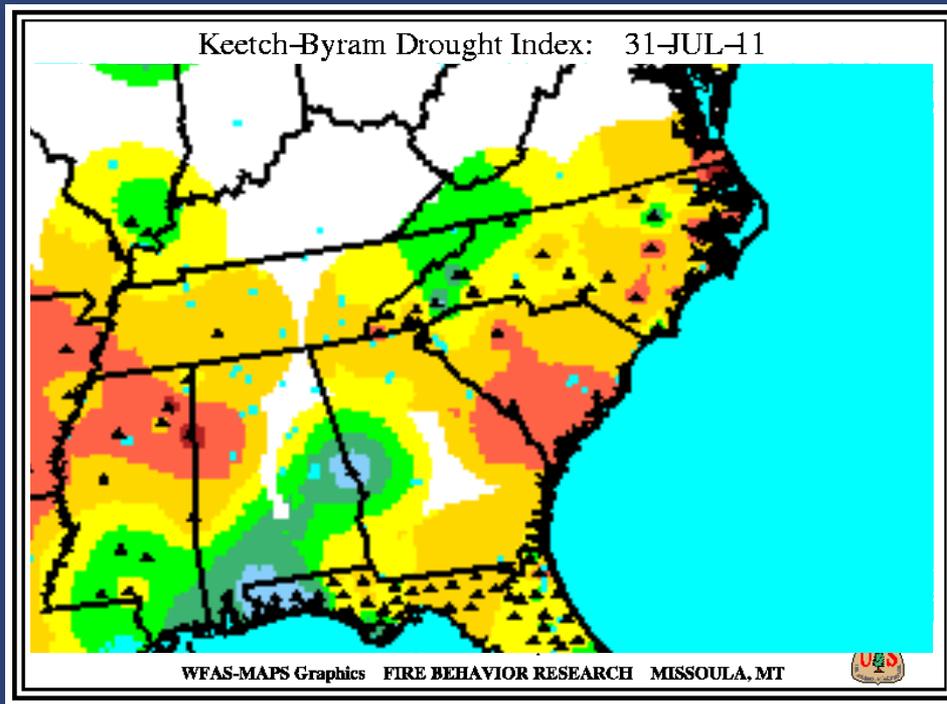
- PRISM annual average precipitation
- PRISM daily maximum temperatures
- AHPS daily precipitation



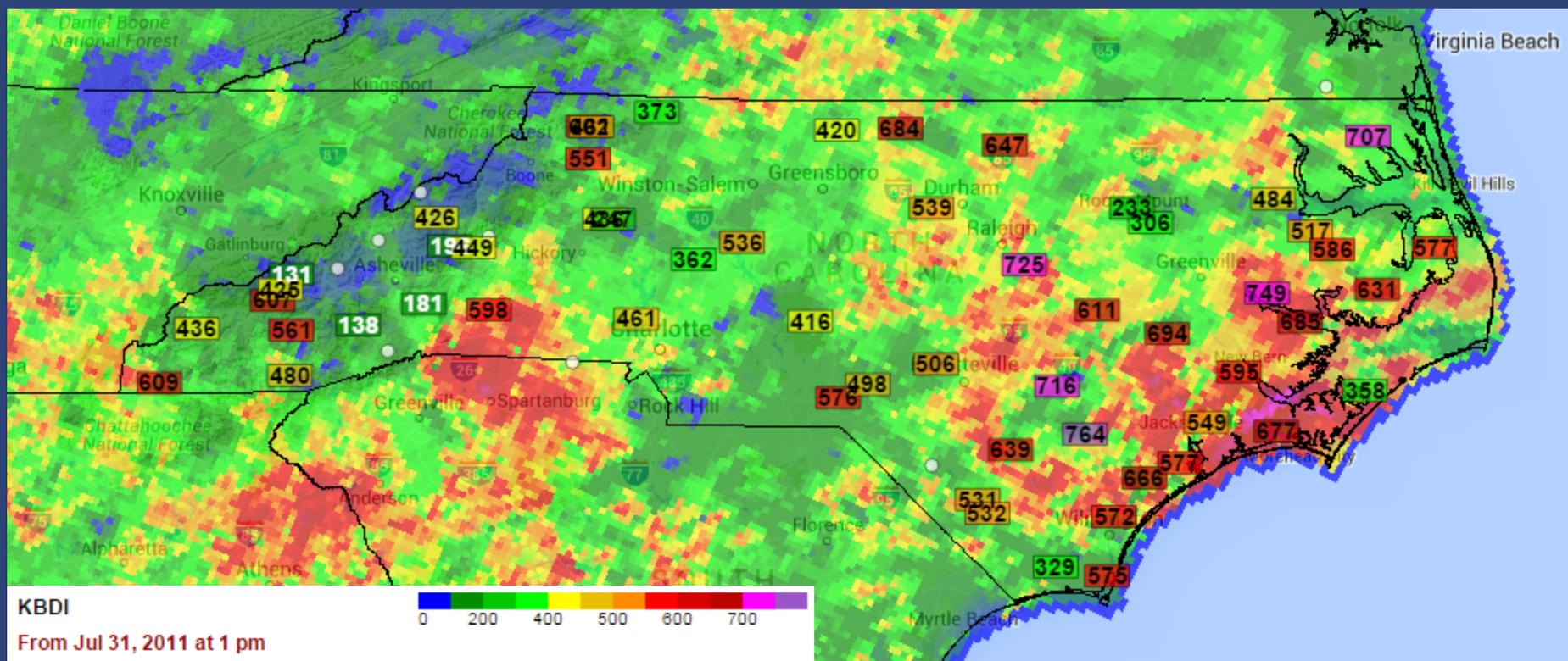
Point vs. Gridded KBDI



Point vs. Gridded KBDI



Gridded KBDI vs. Point KBDI



Energy Release Component

- NFDRS fire behavior parameter
- Models the fuel load that may burn
- Based on temp., RH, precip., fuel model
- Point-based, not gridded



Correlation Results

	Alligator River (<i>n</i> = 349 days)	Allen Road (<i>n</i> = 278 days)	Green Swamp (<i>n</i> = 51 days)
Soil moisture vs. 1-month SPI	0.253	-0.075	0.833
Soil moisture vs. 2-month SPI	0.483	-0.235	0.725
Soil moisture vs. 3-month SPI	0.479	-0.316	0.648
Soil moisture vs. 4-month SPI	0.391	-0.352	0.711
Soil moisture vs. gridded daily precipitation	0.017	0.125	0.091
Soil moisture vs. gridded KBDI	0.372	-0.331	-0.563
Soil moisture vs. RAWS ERC (fuel model O)	-0.116	-0.057	-0.254
Soil moisture vs. RAWS ERC (fuel model G)	0.147	0.011	-0.217



Challenges

- Terrain, drainage, and composition in organic-rich regions
- Factors not captured by weather or drought indices
- Lack of consistent, robust soil moisture data from organic sites



Moving Forward

- Remotely sensed soil moisture? (SMAP)
- Additional monitoring sites
 - Dare Bomb Range supporting 2 new sites
 - Soil moisture/humidity monitoring
 - Set up breakpoints for ESP or adjective rating
- Other applications
 - Estuarine salinity, dissolved oxygen content



Further Work

- New fire weather staff in NCFS (welcome Cabe!)
- Renewed interest in organic soil monitoring, smoke dispersion modeling
 - Gridded ERC?
- Additional audiences (US FWS, NPS)
- Portal expansion (coming end of 2016)
- Custom alerts?
- Drought, fire risk under climate change?

